CLAIMS

What is claimed is:

1. A switching regulator, comprising:

a power switch coupled between first and second terminals, the first terminal to be coupled to an energy transfer element of a power supply and the second terminal to be coupled to a supply rail of the power supply;

a control circuit coupled to a third terminal and the power switch, the third terminal to be coupled to an output of the power supply, the control circuit coupled to generate a feedback signal responsive to the output of the power supply, the control circuit coupled to switch the power switch in response to the feedback signal, the control circuit coupled to switch the power switch at a fixed switching frequency for a first range of feedback signal values, the control circuit coupled to vary a switching frequency of the power switch without skipping cycles in response to the feedback signal for a second range of feedback signal values.

2. The switching regulator of claim 1 wherein the control circuit comprises:

a feedback signal circuit coupled to the third terminal, the feedback signal circuit coupled to generate the feedback signal; and

a pulse width modulator circuit coupled to switch the power switch in response to the feedback signal.

3. The switching regulator of claim 1 wherein the first and second ranges of the feedback signal correspond to first and second ranges of levels of a load coupled to the output of the power supply.

4. The switching regulator of claim 2 wherein the first and second ranges of the feedback signal correspond to first and second ranges of on-time values of a drive signal generated by the pulse width modulator circuit to switch the power switch.

5. The switching regulator of claim 2 wherein the first and second ranges of the feedback signal correspond to first and second ranges of duty cycle percentage values of a drive signal generated by the pulse width modulator circuit to switch the power switch.

6. The switching regulator of claim 2 wherein an off-time value of a drive signal generated by the pulse width modulator circuit to switch the power switch varies as a function of a level of a load coupled to the output of the power supply to vary the switching frequency of the power switch without skipping cycles for the second range of feedback signal values.

7. The switching regulator of claim 2 wherein on-time and off-time values of a drive signal generated by the pulse width modulator circuit to switch the

power switch vary simultaneously as a function of a level of a load coupled to the output of the power supply to vary the switching frequency of the power switch without skipping cycles for the second range of feedback signal values.

8. The switching regulator of claim 7 wherein the off-time value of the drive signal is varied as a function of the on-time value and a first on-time value of the drive signal, the first on-time value of the drive signal corresponding to an on-time of the drive signal at a boundary between the first and second ranges of feedback signal values.

9. The switching regulator of claim 2 wherein the switching frequency of the power switch is reduced without skipping cycles for the second range of feedback signal values as a level of load coupled to the output of the power supply is reduced.

10. The switching regulator of claim 9 wherein the switching frequency of the power switch is reduced without skipping cycles to a minimum frequency when a duty cycle percentage value of a drive signal generated by the pulse width modulator circuit to switch the power switch is substantially equal to zero percent.

11. A power supply, comprising:

an energy transfer element having an energy transfer element input and an energy transfer element output coupled to an output of the power supply;

a switching regulator circuit including a power switch coupled to the energy transfer element input, and a control circuit coupled to the power switch and the output of the power supply, the control circuit coupled to generate a feedback signal responsive to the output of the power supply, the control circuit coupled to switch the power switch in response to the feedback signal, the control circuit coupled to switch the power switch at a fixed switching frequency for a first range of feedback signal values, the control circuit coupled to vary a switching frequency of the power switch without skipping cycles in response to the feedback signal for a second range of feedback signal values.

12. The power supply of claim 11 wherein the control circuit comprises:

a feedback signal circuit coupled to the output of the power supply, the feedback signal circuit coupled to generate the feedback signal; and

a pulse width modulator circuit coupled to switch the power switch in response to the feedback signal.

13. The power supply of claim 12 further comprising an output sense circuit coupled between the output of the power supply and the switching regulator circuit, the output sense circuit coupled to provide an output sense signal to the switching regulator that is proportional to an output voltage or current supplied by the output of the power supply, wherein a duty cycle variation provided by a drive signal generated by the pulse width modulator circuit to switch the power switch is inversely proportional to the output sense signal.

14. The power supply of claim 11 wherein the first and second ranges of the feedback signal correspond to first and second ranges of levels of a load coupled to the output of the power supply.

15. The power supply of claim 12 wherein the first and second ranges of the feedback signal correspond to first and second ranges of on-time values of a drive signal generated by the pulse width modulator circuit to switch the power switch.

16. The power supply of claim 12 wherein the first and second ranges of the feedback signal correspond to first and second ranges of duty cycle percentage values of a drive signal generated by the pulse width modulator circuit to switch the power switch.

17. A method for regulating a power supply, comprising:

switching with a drive signal a power switch coupled to an energy transfer element of the power supply to control power delivered to an output of the power supply;

generating a feedback signal in response to the output of the power supply;

maintaining a frequency of the drive signal at a fixed frequency for a first range feedback signal values; and

varying the frequency of the drive signal without skipping cycles in response to the feedback signal for a second range of feedback signal values.

18. The method for regulating the power supply of claim 17 further comprising varying a duty cycle of the drive signal substantially in response to the feedback signal.

19. The method for regulating the power supply of claim 17 wherein generating the feedback signal in response to the output of the power supply comprises monitoring a current representative of a level of the load coupled to the output of the power supply.

20. The method for regulating the power supply of claim 18 wherein generating the feedback signal in response to the output of the power supply comprises monitoring an on-time of the drive signal.

21. The method for regulating the power supply of claim 20 wherein monitoring the on-time of the drive signal comprises timing the on-time of the drive signal with a timer circuit, the method further comprising suspending operation temporarily of an oscillator circuit if the on-time of the drive signal is less than a first on-time value.

22. The method for regulating the power supply of claim 21 wherein timing the on-time of the drive signal with the timer circuit comprises

discharging a capacitor at a first rate during the on-time of the drive signal; and

discharging the capacitor at a second rate during an off-time of the drive signal, the first rate greater than the second rate.

23. The method for regulating the power supply of claim 22 further comprising maintaining a voltage level of a suspended oscillating signal generated by the oscillator circuit while the operation of the oscillator circuit is temporarily suspended.

24. The method for regulating the power supply of claim 23 further comprising resuming operation of the oscillator circuit after the capacitor has been discharged.

25. A switching regulator, comprising:

a power switch coupled between first and second terminals;

a control circuit coupled to a third terminal and coupled to the power switch, the control circuit coupled to receive an output sense signal responsive to an output of a power supply, the control circuit coupled to generate a drive signal to switch the power switch in response to the output sense signal to control the output of the power supply; and

a timer circuit included in the control circuit, the timer circuit coupled to time an on-time of the drive signal, the timer coupled to the control circuit to vary a switching frequency of the drive signal without skipping cycles if the on-time of the drive signal is less than a first on-time value, the drive signal to have a fixed switching frequency if the on-time of the drive signal is greater than the first on-time value.

26. The switching regulator of claim 25 wherein the timer circuit comprises a capacitor that is coupled to be charged and discharged in response to the drive signal, the capacitor to be discharged at a first rate during the on-time of the drive signal, the capacitor coupled to be discharged at a second rate during an off-time of the drive signal, the first rate greater than the second rate.

27. The switching regulator of claim 26 wherein the timer circuit further comprises first and second current sources coupled to discharge the capacitor at the first rate, the second current source coupled to discharge the capacitor at the second rate.

28. The switching regulator of claim 26 wherein the control circuit comprises an oscillator circuit coupled to generate an oscillating signal, the oscillator circuit to suspend generating the oscillating signal if the on-time of the drive signal ends prior to the capacitor being discharged, the oscillator circuit

coupled to resume generating the oscillating signal after the capacitor has been discharged.

29. The switching regulator of claim 28 wherein the oscillator circuit is coupled to maintain a voltage level of the oscillating signal while the oscillator circuit is suspended, the oscillator circuit is coupled to resume the oscillating signal from the maintained voltage level.